2002
Higher School Certificate
Trial Examination

Biology

General Instructions

- Reading time – 5 minutes
- Working time – 3 hours
- Board approved calculators may be used
- Write using black or blue pen
- Draw diagrams using pencil
- Write your student number and/or name at the top of every page

Total Marks – 100

Section I
Total marks (75)
This section has two parts, Part A and Part B

Part A
Total marks (15)
Attempt questions 1 – 15
Allow about 30 minutes for this part

Part B
Total marks (60)
Attempt questions 16 – 31
Allow about 1 hour 45 minutes for this part

Section II (Pages 15 – 19)
Total marks (25)
Attempt ONE question from questions 32 – 36
Allow about 45 minutes for this section

This paper MUST NOT be removed from the examination room

STUDENT NUMBER/NAME: ……..

STUDENT NUMBER/NAME: …….....

Section I

Total marks (75)

Part A
Total marks (15)
Attempt questions 1 – 15
Allow about 30 minutes for this part

Select the alternative A, B, C or D that best answers the question and indicate your choice with a cross (X) in the appropriate space on the grid below.

	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

STUDENT NUMBER/NAME: …….....

1. Mammalian blood needs to be maintained within a specific pH range. pH is the term used to describe:

(A) the concentration of salt
(B) the acidity of a substance
(C) enzyme substrate concentration
(D) the metabolic rate of an organism

2. The group of organisms which are all Australian native *ectotherms* is:

(A) kangaroo, kookaburra, echidna
(B) echidna, long necked tortoise, green tree frog
(C) frilled lizard, echidna, kangaroo
(D) long necked tortoise, frilled lizard, green tree frog

3. Blood in the *pulmonary artery* compared to blood in the *aorta* will have:

(A) more oxygen and more carbon dioxide
(B) more oxygen and less carbon dioxide
(C) the same concentration of oxygen and carbon dioxide
(D) less oxygen and more carbon dioxide

4. The enzyme in humans that converts maltose to glucose is called maltase. If the temperature of a system using this enzyme dramatically increases, the most likely effect will be:

(A) a buffer system will maintain the temperature to allow the enzyme to function normally
(B) no effect since enzymes are not affected by temperature
(C) the enzyme may denature and not be able to convert maltose to glucose
(D) the increased temperature will increase the rate of glucose production

5. John F. Kennedy, the president of the United States of America, who was assassinated in 1963, had Addison's Disease. This meant that his adrenal gland did not secrete enough *aldosterone* and he needed to have hormone replacement therapy to regulate:

(A) the levels of carbon dioxide in the blood
(B) his ability to maintain metabolic and physiological responses to his environment
(C) his body temperature
(D) the correct salt levels in the blood

6. One side of a DNA strand has the following sequence of bases:

A-T-T-G-C-A

Where A = adenine, T = thymine, G = guanine, C = cytosine and U = uracil.

The complementary base sequence of the DNA molecule would be:

(A) T-A-A-C-G-T
(B) A-T-T-G-C-A
(C) T-U-UC-G-T
(D) U-A-A-C-G-U

7. The process of *artificial insemination* involves:

(A) placing a fertilised egg cell into the uterus of another member of the same species
(B) artificially placing semen, containing sperm, from a male into a female of the same species
(C) artificially placing the nucleus of a sperm cell into an egg cell of the same species
(D) removing the nucleus of an egg cell and replacing it with the nucleus of a sperm cell from the same species

8. Which of the following would probably **NOT** cause mutations to occur?

(A) ultra-violet light
(B) chemicals such as thalidomide and 'Agent Orange'
(C) inbreeding of close relatives
(D) radiation emitted from nuclear power plants

9. It is thought that swans evolved to have long necks mainly through:

(A) changes in their physical environment
(B) competition for limited food resources
(C) constant stretching to reach food on the bottom of aquatic environments
(D) changes in their chemical environment

10. While experimenting with garden pea plants, Gregor Mendel discovered that the factor for green seedpods appeared to be dominant over the factor for yellow seedpods. In one experiment, Mendel bred pea plants and produced 800 seedpods from a cross between a heterozygous green seedpod plant and a yellow seedpod plant. His expected results would have been:

(A) 800 green pods and 0 yellow pods
(B) 600 green pods and 200 yellow pods
(C) 400 green pods and 400 yellow pods
(D) 200 green pods and 600 yellow pods

11. The change in scientific thinking most likely attributed to *Macfarlane Burnet* is:

(A) certain diseases are transmitted by insect vectors; and these are one of the greatest reasons for current human disease occurrence
(B) the body's mechanism for fighting disease relies on cells with receptors for recognising 'self'
(C) scientific techniques may be used in the understanding and prevention of diseases caused by microbes
(D) certain diseases of humans are caused by environmental factors only

12. *Prions* are a unique causative agent of disease in that they:

(A) are acellular
(B) do not respond to antibiotics
(C) are proteins which initiate the immune response
(D) lack nucleic acids

13. Applications of research into high blood pressure by the National Health and Medical Research Council has halved the number of strokes and reduced the number of heart attacks. This kind of epidemiological data provides evidence that vascular disease is partly:

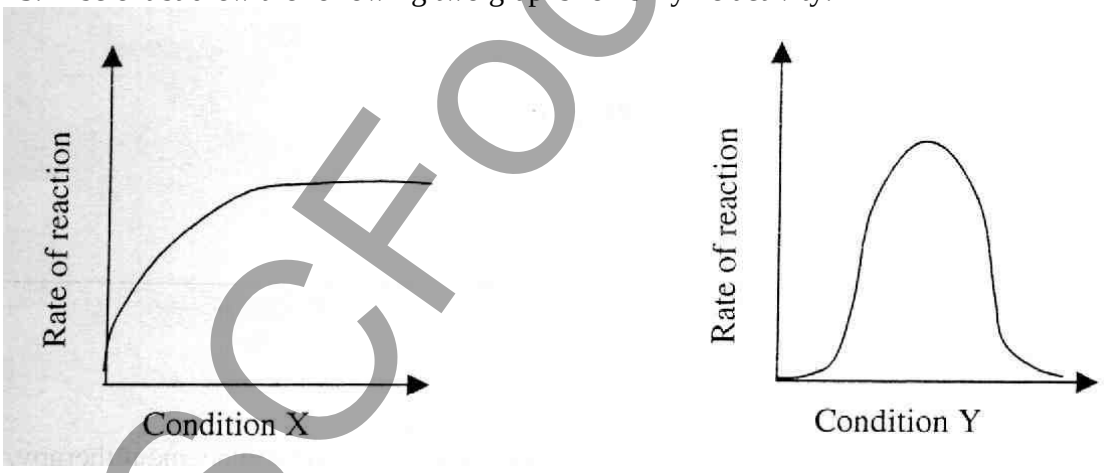
(A) genetic
(B) infectious
(C) avoidable
(D) environmental

14. A hospital laboratory technician was examining some culture plates. She noticed a colony from a strain of relatively harmless gut bacteria called *enterococcus* growing on a culture medium containing three different antibiotics. Enterococci are also commonly found in wounds infected with the dangerous bacterium *Staphylococcus aureus* ('Golden Staph').

Use your understanding of bacteria and the problem of antibiotic resistance to decide which of the following statements is most correct.

(A) There is no way of killing this *enterococcus* bacterium now that it has become resistant to antibiotics
(B) Even though the *enterococcus* bacterium is relatively harmless, the laboratory technician should still report her observation, as genetic information controlling resistance to these antibiotics could be transferred from *enterococcus* to disease-causing bacteria, like *Staphylococcus aureus,* by transduction or conjugation
(C) The *enterococcus* bacterium could still cause harm to humans by feeding on these antibiotics, when they were prescribed by doctors, and so prevent these antibiotics from protecting against disease-causing bacteria, like *Staphylococcus aureus*
(D) If people ingested these *enterococcus* bacteria with their food, these people would become resistant to the antibiotics.

15. A scientist drew the following two graphs for enzyme activity.



Which row in the table below gives possible correct matches for these graphs?

	Condition X	**Condition Y**
(A)	Increasing temperature	Increasing substrate concentration
(B)	Increasing substrate concentration	Increasing pH
(C)	Increasing temperature	Increasing pH
(D)	Increasing pH	Increasing temperature

Section I (continued)

Part B – 60 marks
Attempt questions 16 – 31
Allow about 1 hour and 45 minutes for this part

Answer the questions in the spaces provided.

Marks

Question 16 (4 marks)

Recent media coverage has created some controversy over hormone replacement therapy. Outline the use of hormone replacement therapy in people who cannot secrete *aldosterone* and discuss the importance of this therapy. **4**

……
……
……
……
……
……
……
……

Question 17 (4 marks)

Define the term *enantiostasis* and discuss its importance to estuarine-living organisms. **4**

……
……
……
……
……
……
……
……

STUDENT NUMBER/NAME: …….....

Question 18 (2 marks)

Marks

Identify the forms in which *oxygen* and *carbon dioxide* are transported in the human circulatory system. **2**

……
……
……
……

Question 19 (4 marks)

(a) Describe ***homeostasis.*** **1**

.....
.....

(b) Explain, using an example, the TWO stages of homeostasis. **3**

……
……
……
……
……
……

Question 20 (3 marks)

Explain the requirement for *feedback mechanisms* in organisms. Illustrate your answer with a specific example that identifies the relevant stimuli and responses, and any receptors and effectors involved. **3**

……
……
……
……
……....

STUDENT NUMBER/NAME: …….....

Marks

Question 21 (3 marks)

Darwin and Wallace developed the *theory of evolution* which involves the process of natural selection and isolation. This includes the processes of both divergent and convergent evolution.

(a) Give an example of TWO organisms that demonstrate the process of *convergent* evolution. **1**

……
……

(b) Briefly explain why convergent evolution occurs and identify the result of convergent evolution. **2**

……
……
……
……

Question 22 (3 marks)

Name ONE *transgenic* species that you have studied. Briefly state the process used and why it was developed. **3**

……
……
……
……

Please turn over

STUDENT NUMBER/NAME: …….....

Question 23 (6 marks)

Marks

Genetic variation within a species is important for the survival of the species in a changing environment. The processes of meiosis and sexual reproduction are instrumental in creating this variation. Name and briefly describe THREE ways variation is created in the formation of gametes and sexual reproduction.

6

……
……
……
……
……
……
……
……
……
……
……
……

Question 24 (2 marks)

Alisa bought two genetically identical bottlebrush plants that were produced from cuttings of the same parent plant. She planted one by itself in the middle of her front yard and the other next to the fence in her back garden. After two years, she noticed the one in the front was very bushy and full of foliage all around the plant and the one in the back garden had leaves and branches growing primarily from one side of the plant. However, the one in the front yard had leaves that were yellowish in colour and unhealthy looking while the one in the backyard had good healthy looking green leaves.

Briefly explain how the environment may have affected the expression of the genes controlling the leaf colour and plant shape.

2

……
……
……
……

STUDENT NUMBER/NAME: …….....

Question 25 (3 marks) **Marks**

Explain the need to maintain ***biodiversity*** and identify TWO current efforts to monitor biodiversity. **3**

……
……
……
……
……

Question 26 (3 marks)

Use an example to outline how the body's natural ***microflora*** prevents disease when an imbalance occurs. **3**

……
……
……
……
……

Question 27 (4 marks)

(a) Describe a method which could be performed in the school laboratory to model Pasteur's Classic ***Swan-Neck Flask*** Experiment to identify the role of microbes in decay. (Use diagrams if it helps to describe the method) **3**

……
……
……

(b) State the hypothesis being investigated in (a) above. **1**

……
……

STUDENT NUMBER/NAME: …….....

Question 28 (4 marks)

Marks

Two alternative methods of *immunisation* against measles involve injecting:

(i) antigens of the pathogen

OR

(ii) vaccine containing antibodies separated from human blood serum.

Assess the effectiveness of each method of immunisation. **4**

……
……
……
……
……
……
……

Question 29 (5 marks)

(a) For a NAMED human disease identify the pathogen and its insect vector. **2**

……
……

(b) Draw a simple diagram of the life cycle of the pathogen. Identify where prevention OR control of the disease would be most effective. **3**

Question 30 (4 marks)

'The body's *Third Line of Defence* can provide immunity against certain diseases'.

Describe and explain this statement in terms of cells and cell products. **4**

……
……
……
……
……
……

STUDENT NUMBER/NAME: …….....

Marks

Question 31 (6 marks)

During your Biology course, you performed *first-hand* investigations using the *light microscope.*

Assume that you are given a prepared 'human blood cells' microscope slide.

(a) Explain the methods you would use to observe this slide under 'high power' of your microscope. **3**

……
……
……
……
……
……

(b) Draw *scaled diagrams* to demonstrate the difference between red and white blood cells, in terms of size and shape. **3**

End of Section 1

Please turn over

STUDENT NUMBER/NAME: …….....

Section II

25 marks
Attempt ONE question from Questions 32 – 36
Allow about 45 minutes for this section

Answer the question in a writing booklet. Extra writing booklets are available.

Question 32 Communication 15

***Questions for other option topics are available upon request. Email: andy@invertigo.com.au**

STUDENT NUMBER/NAME: …….....

Question 32 – Communication (25 marks) **Marks**

(a)

(i) What is the function of the iris in the eye? **1**

(ii) State the name of the light sensitive pigment in rods in the human eye and also the colours to which the pigment is most sensitive. **2**

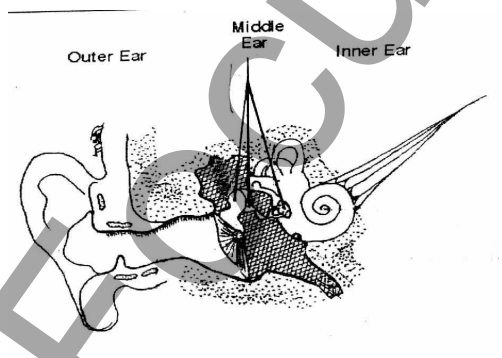
(b)

(i) What information would you need about the distribution of rods and cones in the eyes of animals to predict which animals are active at night? **2**

(ii) Compare the visual acuity of a human with that of most insects. **2**

(c) Distinguish between myopia and hyperopia and describe technologies that can be used to correct these conditions. **5**

(d) The diagram below shows part of the human ear.



6

Outline the path of a sound wave through the external, middle and inner ear and identify and justify which parts are most likely to be affected by chronic exposure to sounds of different frequencies.

(e)

(i) Explain the cause of colour blindness in humans. **3**

(ii) Describe cataracts and how this condition can be corrected using technology. **3**

(iii) Identify the types of energy transfer occurring in a conventional hearing aid. **1**

End of Question 32.

STUDENT NUMBER/NAME: …….....